

**INSTRUCTIONAL DEVELOPMENT OF INTRODUCTION TO
STATISTICS BASED ON DICK AND CAREY'S MODEL
(A STUDY AT THE FACULTY OF ECONOMICS AND BUSINESS,
MUHAMMADIYAH UNIVERSITY, JAKARTA)**

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Abstract: *In the instructional practice, it is necessary to clearly understand the objectives and scope of instructional in these two subjects so that there is no overlap. In addition, to measure the success of instructional and the right strategies, appropriate tests are required to become an efficient and effective instructional. The research method used in this study is the development research method in education by Borg and Gall (2007). Finding or developing a specific program facilitates and improves the quality of instructional outcomes for students participating in the Introduction to Statistics subject. From the results of observations of the teaching and instructional process for the Introduction to Statistics subject. Students unable to use statistical analysis are related to instructional problems, namely, instructional strategies that refer to the needs and characteristics. Conducting experimental research can be followed up by looking at the advantages of using instructional materials. The instructional materials are in books designed based on student needs, based on a compilation of materials in several textbooks.*

Keywords: *Instructional Design, Dick and Carrey Method, Statistic*

Introduction

The conflict between rationalists and empiricists has created a new form of thinking, namely scientific thinking. Suppose rationalism with its deductive method teaches that something considered valid is reasonable or logical. In that case, empiricism with its induction method teaches that the characteristics of something considered authentic are empirical or can be captured by the five senses. Scientific thinking with the scientific method combines the two methods. According to the adherents of this method, even though a phenomenon empirically appears to have a

causal relationship, if it cannot be accepted by logical reason, then the causality cannot be scientifically accepted. To think scientifically requires thinking tools such as language, mathematics, and statistics (Suriasumantri, 1985). A thinking tool is a tool that helps the steps in scientific activities. Mathematics is a tool that helps in the process of deductive thinking. Statistics help inductive thinking, while language is a tool that can help scientists communicate their thoughts.

Furthermore, Suriasumantri stated that Statistics is the knowledge that must receive serious attention to accelerate the development of scientific activities in Indonesia (Suriasumantri, 1985). He said that those involved in scientific activities must be equipped with sufficient statistics to make the scientific conclusions they draw valid. Awareness of the importance of statistics in the process of scientific thinking can be seen by lecturing Statistics in almost every study program, including in the social sciences. It started when quantitative thinking was overgrowing in economics (Nasution, 1975). With the help of statistical analysis, economics is now a social science that already can predict economic phenomena to occur so that control can be carried out on future economic issues (Iqbal, 1990).

Instructional Statistics in the Management Study Program, Faculty of Economics and Business University of Muhammadiyah Jakarta is presented in two subjects, namely (a) Introduction to Statistics and (b) Applied Statistics. Introduction to Statistics is directed to study descriptive and inductive statistics. Applied Statistics is intended to equip students to be proficient in using statistics as a knife analysis in managing, analyzing, drawing conclusions, and making decisions based on the presented quantitative data.

In the instructional practice, it is necessary to clearly understand the objectives and scope of instructional in these two subjects so that there is no overlap. In addition, appropriate tests are also needed to measure the success of instructional and the right strategies to become an efficient and effective instructional. For this reason, it is necessary to conduct a study on the instructional model of these two subjects. In this opportunity, the study was conducted on the Introduction to Statistics instructional model with the problem formulation "How is the development of an Introduction to Statistics instructional model for undergraduate students at the Faculty of Economics and Business, University of Muhammadiyah Jakarta?"

Research Method

- **Place and time of research**

This research was conducted at the Management Study Program, Faculty of Economics and Business, University of Muhammadiyah Jakarta. Data collection is carried out from June to August 2021.

- **Research Approach and Method**

The approach used in this research is a systems approach. Each stage of development is equally important, carried out in a systematic, planned, measurable manner, and following the criteria and procedures required in the design model used.

The instructional design that becomes the reference is Dick and Carey's instructional design model (Dick et al., 2005).

The research method used in this study is the development research method in education by Borg and Gall. This method is used to find or develop a particular program to facilitate and improve the quality of instructional outcomes for students participating in the Introduction to Statistics subject (Gall et al., 2007).

Theory and Concept

- **Instructional Development Model**

In the literature, it is found that there are some instructional development models. From a survey conducted by Kent L Gustafson, various instructional development models can be explained as shown in the following Table 1 (Gustafson et al., 1991).

Table 1 VARIOUS INSTRUCTIONAL DEVELOPMENT MODELS

No	Focus	Model
1	Type	Gerlach & Ely (1980) JE Kemp (1977) Devis, Alexander, dan Devis (1974) Leslie J. Briggs (1980) DeCecco (1971)
2	Result	Banathy (1968) Dick & Carey (1977)
3	System	Instructional Development Institute Inter-Service Procedure for ISO Courseware Development Process
4	Organization	Blondin (1971) Black and Mouton (1971)

Source 1 Survey of instructional development models. (Gustafson et al., 1991)

The following survey was carried out by Kent L. Gustafson and Maribe Branch in 2002. They said that Dick and Carey's model, first developed in 1977, was revised in 1985 and revised again in 2001 by adding James O. Carey to more accurately referred to as Dick, Carey, and Carey's model, the last revision in 2015, was a pioneer of the instructional design model, which is based on the assumption that instructional is a process that takes place systematically, and in the implementation process, there is a process of communication and interconnected interactions (Gustafson et al., 2002)

The model developed in 1985 is a model that remains considered relevant to be used to develop outcomes-oriented instructional models. The description of existing components and the steps taken to develop an instructional model using Dick and Carey's model is shown in the following Figure 1.

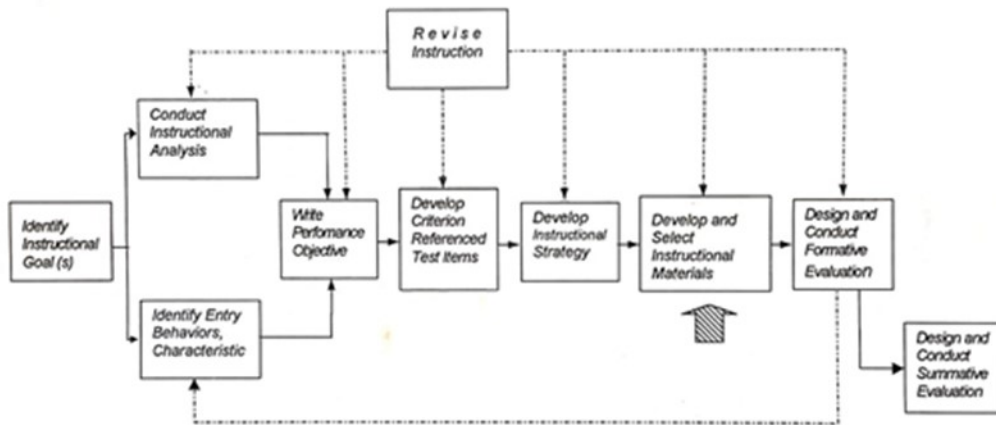


Figure 1 Instructional System Development Model

Source 2 The Systematic Design of Instruction (Dick et al., 2005)

Based on Figure 1, it can be stated that the development steps are explained as follows:

1. Identifying Instructional Objectives

In the first step, it is determined what the instructional objectives will be. This goal can come from needs assessment, practical experience with instructional difficulties students, a task analysis, and many more.

2. Conducting Instructional Analysis

After the goals are set, what students must learn to achieve these instructional goals is determined. Instructional objectives are analyzed into skills that must be mastered by students and arranged from simple to difficult ones.

3. Analyzing Students' Initial Ability and Characteristics

In addition, to achieve some skills that must be learned due to the instructional analysis, it is necessary to determine what knowledge and skills students should already have or initial abilities before participating in instructional. In this development, it is also necessary to consider the unique characteristics of students.

4. Formulating Specific Instructional Objectives

Based on the instructional analysis that has been performed and students' initial skills or abilities. Instructional system designer needs to develop competencies or specific instructional objectives (instructional objectives) that students need to master to achieve general instructional goals (instructional goals). In formulating specific instructional objectives, several things need attention, known as the ABCD (Audience, Behavior, Condition, and Degree) formula as follows:

- a) The audience, explaining which semester students will study.
- b) Behavior determines students' knowledge of skills after participating in the instructional process.

- c) Condition, determining the conditions needed to demonstrate the ability of the knowledge learned.
- d) A degree is an indicator or criteria that can determine student success in achieving specific instructional objectives.

5. Developing Criterion-Referenced Tests

Based on the Specific Instructional Objectives (SIO), questions are compiled and can measure students' success in achieving the SIO.

6. Developing Instructional Strategies

The next step is to develop strategies used in instructional, which includes (a) pre-instructional activities, (b) information presentation, (c) student's activities and feedback, (d) testing, and (e) subsequent activities.

7. Developing and Selecting Instructional Materials

Based on the selected instructional strategy, the next step is to develop materials that include material development and tests. This development depends on the type of instructional to be delivered, the availability of relevant materials, and other instructional resources.

The term instructional materials, often used interchangeably with instructional media, can bring information and messages from instructional resources to students. Instructional materials that can be used include textbooks, guide books, modules, audio-video programs, computer-based instructional materials, multimedia programs, and instructional materials used in distance instructional systems.

8. Designing and Developing Formative Evaluation

After obtaining the design, it is necessary to conduct a formative evaluation to collect data related to the strengths and weaknesses of the instructional program. The results of the formative evaluation process can be used as feedback to improve the draft instructional program. Three types of formative evaluation that can be carried out are:

- a) Individual evaluation (one to one evaluation)

Individual evaluation is a necessary step to make direct contact with one or three potential program users to obtain feedback on the readability and attractiveness of the program.

- b) Small group evaluation

Small group evaluation tests the program on potential users consisting of 10-15 students. This evaluation is carried out to obtain feedback that can be used to improve the quality of the instructional program.

- c) Field evaluation/field trial

Field evaluation is a trial of an instructional program before the program is applied in an actual instructional situation.

9. Revising the Instructional Program

The final step of the instructional design process is to revise the draft instructional program. The data obtained from the formative evaluation procedure is summarized and interpreted to find out the weaknesses of the instructional program. The evaluation is not only conducted on the draft instructional program but also aspects of the design of the instructional system used in the program, such as instructional analysis, entry behavior, and characteristics of students. Formative evaluation procedures need to be carried out on all aspects of the instructional program to improve and better the quality of the program.

10. Designing and developing a summative evaluation.

Summative evaluation is a different type of evaluation from formative evaluation. This evaluation is considered the culmination of the instructional design activity proposed by Dick and Carrey. Summative evaluation is carried out after the program has been evaluated productively and revised according to the standards used by the designer. Summative evaluation does not involve program designers but involves independent assessors, and this is a reason to state that summative evaluation is not included in the instructional system design process. The instructional design step proposed by Dick and Carey is a procedure that uses a systematic approach in designing an instructional program. Each step in instructional design has a relationship with one another.

- **Statistics Instructional**

According to several experts (Subagyo, 1988; Sudjana, 1990; Susanti, 2010; Walpole, 1986), statistics can be grouped into two categories, namely (a) descriptive statistics and (b) inductive statistics. Descriptive statistics are data collection, presentation, determination of statistical values, and making diagrams or drawings about a phenomenon. The purpose of descriptive statistics is to facilitate the comprehension of received information. Inductive statistics is the part of statistics that deals with conclusions about the population being investigated. The purpose of inductive statistics is to draw inferences (conclusions) from an assumption applied to the population.

According to the study, statistics can be divided into theoretical and applied statistics (Suriasumantri, 1985). Theoretical statistics is the knowledge of instructional the basics of statistical theory such as sampling, distribution, estimation, and probability. Applied statistics is the use of statistics adapted to the application area and also mentioned by Nasution, where inductive statistics are separated into mathematical and applied statistics (Nasution, 1975). The first one explains the development of statistical theory, which is more mathematical, while the second one focuses more on ways to use statistical theory in other fields of science.

Sudjana mentions two ways to learn statistics. First, if anybody wants to discuss statistics more deeply, fundamentally, and theoretically, what is instructional is classified into mathematical or theoretical statistics (Sudjana, 1990). In this case, a solid and in-depth mathematical basis is needed, which will discuss, among other things, the derivation of properties, propositions, formulas, creating models, and other theoretical and mathematical aspects. Second, instructional statistics is solely

in terms of its use. In this case, the question is not about the formulas or principles but only how the method and technique or statistical method are used.

Statistics teaching in social science and political science is not intended to learn it theoretically but how these theories can be applied to search, analyze and draw conclusions from social data. In other words, an understanding of statistical theory is not a goal but a tool to achieve a goal to analyze and conclude the ability of social research data to solve problems.

- **Underlying theory in instructional Statistics**

The ability to analyze and conclude data to solve problems in the taxonomy of Gagne and Briggs is included in the category of intellectual skills (intellectual skills) (Gagné et al., 1992). Gagne states that intellectual skills are the ability to use symbols to organize and interact with the environment (Gagné et al., 2010). There are two forms of symbols, i.e., language and number, that can be used in various activities such as reading, writing, distinguishing, combining, classifying, adding up, subtracting, multiplying, dividing, and many more. Using symbols to describe, form concepts and principles, and solve problems produces intellectual skills. The five categories of intellectual skills are (1) discrimination, (2) concrete concepts, (3) abstract concepts, (4) principles, and (5) higher-level principles.

Discrimination is the ability to respond differently to a stimulant with different physical dimensions. A person can discriminate if he can state whether something is different or the same as another based on physical dimensions such as size, color, shape, or sound. In instructional statistics, a person who can state whether "age" and "height" are the same or different with the type of variable can be determined to have the ability to discriminate. Ability is the most basic intellectual skill.

The ability to use concepts is divided into (a) concrete concepts and (b) abstract concepts. A student can learn a concrete concept by identifying new or unlearned examples of a group of objects. The concrete concept is identified by pointing to or marking examples that generally cannot be identified by definition. In instructional Statistics, a student who can show the forms of "tables," "diagrams," "curves," "graphs," and so on can be determined to have the ability to use concrete concepts.

In the case of an abstract concept, a person can learn abstract concepts by using a definition to classify examples that have not been studied before. An example in instructional statistics is the concept of central tendency (mean, median, mode), variable values (range, mean deviation, standard deviation), shared values, which cannot be identified by pointing to concrete objects.

A principle expresses a relationship between two or more concepts. A student can learn a principle if he can apply the principle to examples that were not previously studied. In instructional Statistics, the average value is related to the number of values and the amount of data from a set of data, expressed by the formula: $M = \frac{\sum fx}{N}$ A student who can use these principles to solve problems can be considered to have the ability to use the principles.

In a higher level of principles, a student is considered to have reached a higher principle if he can use two or more principles studied previously to solve problems. This ability involves several concepts and principles, which are then integrated to solve problems. In instructional Statistics, the standard value (Z Score) is related to two principles, namely (a) the average value and (b) the standard deviation, expressed by the formula $Z = \frac{x-m}{N}$. Now students who can use these principles to solve problems can be considered to have the ability to use higher-level principles.

Gagne' further stated that these intellectual skills continuum from the simple to the more complex and have a hierarchical relationship (Gagné, 1989). That is, instructional higher intellectual skills require lower intellectual skills. Alternatively, it can be said that lower intellectual skills are a prerequisite for instructional higher intellectual skills. Thus, it can be concluded that in Statistics teaching, the subject matter needs to be sorted from easy to difficult ones, or in other words, to follow the principles of algorithmic instruction.

- **Framework for The Research**

Based on the theory that has been described, the framework for the research describes as follows:

- a) The instructional objectives of Introduction to Statistics are designed based on student needs and are formulated according to the clear and measurable GIO and SIO formulations.
- b) SIO is the basis for preparing exam questions to measure student instructional success.
- c) Instructional analysis needs to be conducted to arrange behavior logically and systematically.
- d) Develop an instructional strategy to achieve instructional objectives by explaining descriptions, examples, exercises, feedback, and follow-up on each topic taught.
- e) Based on the instructional strategy, instructional materials can be arranged either in SLP, which mixes relevant materials available in the library, or independent instructional materials prepared based on students' needs.

RESULTS AND DISCUSSION

As stated in the previous section, the development of the instructional model in this study follows the steps suggested by Dick and Carey. These steps include (1) Identifying Instructional Needs, (2) Formulating General Instructional Objectives, (3) Conducting Instructional Analysis, (4) Identifying Students' Initial Ability and Characteristics, (5) Formulating SIO, (6) Preparing Benchmark Tests, (7) Developing Instructional Strategies, and (8) Developing Instructional Materials (Dick et al., 2005).

- **Identification of Instructional Needs.**

In this identification, the needs-based on normative needs are used, namely by comparing the abilities that students have possessed with the standard criteria determined by the Introductory Statistics subject curriculum for undergraduate

students, Faculty of Economics and Management, Muhammadiyah University of Jakarta, namely (a) the ability to describe social data. Using descriptive statistical techniques, with the subject of (1) variables, (2) frequency distribution, (3) graphs, (4) curves, (5) central tendencies, (6) quartiles, deciles, percentiles, and percentile grades, (7) variability, and (8) standard values, and (b) ability to analyze social data in the form of relationships between variables with inductive statistical techniques, with the main topics of (1) Correlation, (b) t-test, and (c) Chi-squared, and Analysis of Variance.

Identification of instructional needs for these subjects is carried out with the following steps

a) Identifying gaps

Undergraduate students are expected to describe data using descriptive statistical techniques. Many students have not been able to do this.

b) Assessing gaps

A gap can be assessed from several aspects: the implications or effects on students and educational institutions that provide education. It is an essential issue for students because if they do not master the subject material, they will have difficulties, especially when completing their final project in the form of a thesis when using a quantitative research approach. This approach is also a problem for institutions because it relates to the quality of the student's final project.

c) Analyzing possible causes of gaps

Gap analysis is intended to find out which are related to instructional problems and which are not. Possible causes unrelated to instructional problems are ignored, while those related are used to develop the instructional model. The analysis is carried out by (1) comparing the initial abilities possessed by students with the abilities that students must possess, (2) interviewing students and teaching staff, and researching (more limitedly observing) the teaching and instructional process of the Introduction to Statistics subject. From the results of the interview, it turned out that students experienced several problems as follows: (1) they did not understand what the real purpose of instructional statistics was and how the position of statistics was in science, (2) difficulty in applying mathematical and statistical techniques, (3) difficulty in applying statistical formulas in the field of management and business science, (4) difficulty in understanding the principles of using specific techniques in analyzing economic and business data.

The possible causes are then positioned; as a result to find out the cause. From the results of observations of the teaching and instructional process for the Introduction to Statistics subject, several weaknesses were found, two of which (1) in teaching, the lecturer gives lecture materials according to what is stated in the textbook so that the formulas are more mathematical, and (2) examples of exercise are not directly focused on the field of communication science. Thus, it can be concluded that the cause of students unable to use statistical analysis is related to instructional problems, namely related to instructional strategies that should refer to the needs and according to student characteristics.

In the Introduction to Statistics curriculum and relevant books, it can be seen that the contents of the Introduction to Statistics curriculum include (a) Data and Variables, (b) Frequency Distribution, (c) Curves, (d) Central Tendency, (e) Variability, (f) Deviation, and (g) Standard Value.

- **Formulating General Instructional Objectives (GIO)**

Some things that need to be considered in formulating GIO are: (1) it must show that there are people who learn, (2) is GIO formulated before students learn, then the term used is "will be able to," (3) product-oriented, (4) uses active and observable verbs, and (5) has a transparent object. Based on the identification of instructional needs, general instructional objectives are formulated as follows:

1. Students will be able to complete and distinguish the types of variables,
2. Students will be able to compile and provide data narration in the form of frequency distribution tables
3. Students will be able to compose and provide narrative data in the form of graphs
4. Students will be able to understand the types of curves
5. Students will be able to calculate central tendency values and explain their relation to curves
6. Students will be able to calculate and explain the values of quartile, decile, percentile, and percentile level
7. Students will be able to calculate and explain the values of variability
8. Students will be able to calculate and explain common values.

- **Conducting Instructional Analysis.**

An instructional analysis translates general behavior into several specific behaviors arranged systematically and logically. The activity is intended to identify specific behaviors from the earliest to the last. Instructional analysis can be described into four types of structures, namely (1) hierarchical structure, (2) procedural structure, (3) grouping structure, and (4) combination structure.

When a chart is made, the instructional analysis to achieve the GIO-SIO is shown in Figure 2.

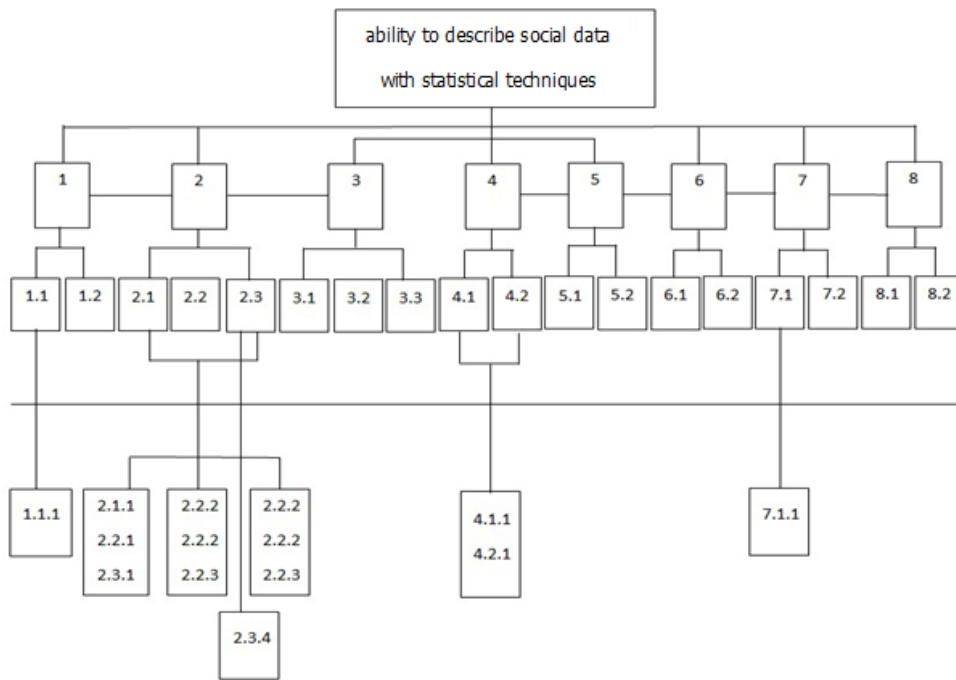


Figure 2 Instructional analysis of the Introduction to Statistics subject.

- 1 = Explaining and distinguishing the types of variables
- 1.1 = Explaining the meaning of variable
- 1.2 = Distinguishing discrete and continuum variables

- 1.1.1 = Distinguishing data and facts

- 2 = Compiling and providing data narration in the form of a frequency distribution table
- 2.1 = Arranging the data into a single frequency distribution table and giving a narration
- 2.2 = Arranging the data into a grouped distribution table and giving a narration frequency
- 2.3 = Compiling a cumulative frequency distribution table from below and from above and giving a narration

- 2.1.1
- 2.2.1 = Composing sentences with correct Indonesian language
- 2.3.1

- 2.1.2 = Adding, subtracting, multiplying, dividing
- 2.2.2
- 2.3.2 = Understanding the meaning of cumulation
- 2.3.4

- 3 = Compiling and providing narrative data in the form of graphs
- 3.1 = Arranging data into a histogram graph
- 3.2 = Arranging data into a polygon graph

- 3.3 = Arranging data into an ogive graph
- 4 = Understanding the types of curves
- 4.1 = Explaining the meaning of symmetrical curve and showing examples correctly
- 4.2 = Explaining the meaning of asymmetric curve and showing examples correctly
- 4.1.1 = Understanding the meaning of symmetric and asymmetric
- 4.2.1 =
- 5. = Calculating the values of the central tendency and explaining its relation to the curve
- 5.1 = Calculating (1) mean, (2) median, (3) mode
- 5.2 = Explaining the relationship between mean, median, and mode values with curve shapes
- 6 = Calculating and explaining the values of quartile, decile, percentile, and percentile level
- 6.1 = Counting (1) quartiles, (2) deciles, (3) percentiles, and (4) percentile levels
- 6.2 = Explaining the values of (1) quartiles, (2) deciles, (3) percentiles, and percentile levels in the classification of certain status.
- 7 = Calculating and explaining the values of variability
- 7.1 = Calculating (1) Range, (2) mean deviation, (3) standard deviation.
- 7.2 = Explaining the meaning of these values to the variability of the values of a group
- 7.1.1 = Counting; adding; reducing; sharing; multiplying; taking root; squaring.
- 8 = Calculating and explaining standard values
- 8.1 = Calculating standard values
- 8.2 = Explaining the meaning of the standard value with the mean and standard deviation

- **Identification of Students' Initial Ability and Characteristics.**

Based on the instructional analysis, it can be seen that the initial abilities needed to take the Introduction to Statistics are that students can:

1. Distinguishing fact data,
2. Composing sentences with correct Indonesian,
3. Adding, subtracting, multiplying, squaring, rooting,
4. Calculating the relative value of the absolute value,
5. Explaining the meaning of cumulation,
6. Explaining the meaning of symmetrical and asymmetrical.

The characteristics of students who take this subject are:

1. Their high school education background is different, namely: Senior High School, Vocational High School, Madrasa Aliyah, and the equivalent,
2. Being in Semester II,
3. Having a high motivation to attend lectures.

- **Specific Instructional Objectives (SIO)**

Based on the instructional analysis that has been explained, SIO can be formulated by:

1. They are provided with several data types to correctly explain variables and distinguish between discrete and continuum variables.
2. They are provided with the raw data to correctly arrange them into a single frequency distribution table and narrate it.
3. They are provided with the raw data to correctly arrange them into a grouped frequency distribution table and narrate it.
4. Being provided with data that has been compiled into a table, students will be able to correctly arrange the cumulative frequency distribution table from below and from above and be able to explain the meaning of the table.
5. They are being provided with discrete and continuum data that have been arranged in the form of tables so that students will be able to arrange them correctly into a histogram graph.
6. They are being provided with the data that has been arranged in the form of tables or graphs so that students will be able to arrange them correctly into polygons.
7. They are being provided with the data that has been compiled in the form of a cumulative frequency distribution table so that students arrange it correctly into an ogive graph and will be able to provide a narrative of the graph.
8. They are showing a picture of a curve to explain the meaning of an asymmetrical curve correctly and show examples correctly.
9. They are being provided with a picture of a curve to explain the meaning of an asymmetric curve and show examples correctly.
10. They are being provided with a single frequency distribution of data in tables and groups so that students can correctly calculate the values of the mean, median, and mode.
11. They are being provided with the mean, median, and mode values so that students can explain the meaning of these values with symmetrical and asymmetrical curves.
12. They are being provided with data in the form of a grouped frequency distribution table so that students can calculate the values of quartiles, details, percentiles, and percentile levels and explain the meaning of these values.
13. They are being provided with a quartile value to correctly explain the meaning of these values to the classification of certain statuses.
14. They are being provided with the data in the form of a grouped frequency distribution table so that students can calculate the value of the range, mean deviation, and standard deviation.
15. Being provided with the value range and standard deviation, students can explain the meaning of these values to the variability of the group's value.

16. They are being provided with the mean and standard deviation so that students can calculate the expected value correctly.
17. They are being provided with a typical value to correctly explain the meaning of the value to the mean and standard deviation.

- **Benchmark Reference Test**

The benchmark reference test consists of test items that directly measure student behavior that has been formulated in SIO.

Before writing the test items, it is necessary to make a test subject matter to suit the SIO that has been formulated. The subject matters are shown in Table 2. Based on Table 2, 40 multiple choice questions have been prepared.

Table 2 INTRODUCTION TO STATISTICAL TEST SUBJECT MATTERS

Capability No. SIO	C.1	C.2	C.3	C.4	C.5	C.6	Total
1	1	-	-	-	-	1	2
2	-	1	1	-	-	-	2
3	-	1	1	-	-	-	2
4	-	2	2	-	-	-	4
5	-	-	2	-	-	-	2
6	-	-	1	-	-	-	1
7	-	1	1	-	-	-	2
8	2	-	-	-	-	-	2
9	-	2	-	-	-	-	2
10	-	-	5	-	-	-	5
11	-	-	-	-	-	3	3
12	-	-	2	2	-	-	4
13	-	-	-	-	1	-	1
14	-	-	4	-	-	-	4
15	-	-	-	-	-	2	2
16	-	-	1	-	-	-	1
17	-	-	-	-	-	1	1
Total	3	7	2	2	1	7	40

- **Instructional strategy**

Based on the 17 Specific Instructional Objectives described above, an instructional strategy is set up. The core of the instructional strategy includes (a) a sequence of instructional activities consisting of introduction, presentation, and closing, (b) method, (c) media, and (d) time required. The following is an example of an SIO instructional strategy number 1: 'being provided with several types of data so that students can correctly explain variables and distinguish between discrete variables and continuum variables.'

Table 3 Instructional Strategy Objective

No	A sequence of Instructional Activity	Method, Media, and Time			
		Method	Media	Time (in a minute)	
				Lecturer	Student

	Introduction					
D	In instructional statistics, an understanding of variables is essential. To understand the variables, it is necessary to know the properties of the data.	Lecture	Computer and LCD Projector	5	-	5
R	Data has two properties: constant and changing—which values can change.	Lecture	Computer and LCD Projector	5	-	5
T	Being provided with a type of data, students will explain the definition of variables and distinguish between discrete and quinine variables.	Lecture	Computer and LCD Projector	1	-	1
	Delivery					
U	Explaining - Meaning of variable - Types of variable	Lecture	Computer and LCD Projector	40	-	40
C	The lecturer showed several examples of social data.	Lecture	Computer and LCD Projector	5	5	5
L	Students are asked to explain the meaning of variables and sort the data based on the type of variables.	Lecture	Computer and LCD Projector	-	15	15
	Closing					
TF	Students are given the task of taking an inventory of social data, explaining the meaning of variables, and sorting data based on the types of variables.	Self-Study	Exercise	-	25	25
UB	The evaluation will be given to students whose answers are 100% correct, and their scores are included in the structured task. Those who have not got the evaluation are given equivalent questions to work on and collect them the following week.	-	-	-	-	-
	Total			56	40	96

- **Developing instructional materials**

Instructional materials were developed based on the instructional strategies described in section G. The results were based on the materials development results. There are three instructional materials. First (a), a module in an Introduction to Statistics book. The book is 93 pages thick, consisting of eight chapters: the following formulated number of General Instructional Objectives, (b) instructional media in the form of PowerPoint, and (c) a test consisting of 40 questions to measure the success of instructional Introduction Statistics.

Result and Discussion

- **Result**

Based on the description that has been stated in the previous section, the following conclusions are drawn:

1. There are 8 GIOs and 17 SIOs in the Introduction to Statistics subject for second-semester students of the Management Study Program, Faculty of Economics and Business, University of Muhammadiyah Jakarta.
2. To determine the success of students, 40 questions have been designed that can be used to measure success in Introduction to Statistics instructional
3. The results of the instructional analysis found a logically structured behavior. The structure forms a hierarchy, procedural, and groups.
4. There are 17 tables of instructional strategies used to compile instructional materials. They are based on needs and the ones based on available textbooks.
5. Two types of instructional materials are organized in the form of books, namely (a) instructional materials arranged based on needs and (b) instructional materials arranged in the form of instructional materials compilations in specific chapters of textbooks available in the library.

- **Recommendation**

This research can be followed up by conducting experimental research that looks at the advantages of using instructional materials. The instructional materials are in books designed based on student needs, based on a compilation of materials in several textbooks.

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